

# Tuberculosis Screening among Homeless Persons with AIDS Living in Single-Room-Occupancy Hotels

## ABSTRACT

Congregate facilities for homeless persons with the acquired immunodeficiency syndrome (AIDS) are often endemic for tuberculosis. We evaluated tuberculosis screening methods at single-room-occupancy hotels housing persons with AIDS. Residents were screened by cross matching the New York City Tuberculosis Registry, interviewing for tuberculosis history, skin testing, and chest radiography. Cases were classified as either previously or newly diagnosed. Among the 106 participants, 16 (15%) previously diagnosed tuberculosis cases were identified. Participants' tuberculosis histories were identified by the questionnaire (100%) or by registry match (69%). Eight participants (50%) were noncompliant with therapy. These findings prompted the establishment of a directly observed therapy program on site. (*Am J Public Health*. 1995;85:1555-1559)

### Introduction

Shelters and other congregate facilities remain endemic sites of tuberculosis.<sup>1-8</sup> In New York City, the Division of AIDS Services provides housing support to homeless persons with AIDS. Because of a shortage of available housing, clients are temporarily placed in commercial single-room-occupancy hotels. These hotels are privately owned, are operated for profit, and have few common areas other than the bathrooms and lobby. In more than one third of these hotels, 80% of rooms are occupied by Division of AIDS Services clients; the remainder are rented to private tenants. Before this investigation, these facilities had no tuberculosis screening or treatment programs on-site.

In October 1992, we investigated the extent of tuberculosis in these facilities and evaluated potential tuberculosis screening strategies. At that time, the Division of AIDS Services provided housing support to 10 109 persons with AIDS; of these, 1725 (17%) were housed in 32 single-room-occupancy hotels. The median number of clients per hotel was 44 (range = 12 to 124 clients per hotel).

### Methods

#### Case Definitions

We defined active tuberculosis, diagnosed by culture or clinical criteria,<sup>9</sup> as either previously identified (in residents who had not yet completed therapy<sup>10</sup>) or newly identified (if diagnosed as a result of our investigation). Noncompliance with therapy was defined as two consecutive missed clinic appointments or discontinuation of antimycobacterial therapy for 14 consecutive days.<sup>11</sup>

#### Screening Methods

Residents and employees of hotel A, a large single-room-occupancy hotel in Manhattan, were first computer matched by name and birth date against the New York City Tuberculosis Registry to identify cases at that hotel already reported to

the health department. To find cases not identified by the registry cross match, we screened residents by (1) interviewing for symptoms (fever, cough, weight loss, or night sweats) and tuberculosis history; (2) conducting tuberculin skin tests by means of the Mantoux method, with five tuberculin units (Aplisol, Parke-Davis, Morris Plains, NJ), and conducting anergy tests with both mumps and candida antigens; and (3) performing portable frontal-view chest radiographs.

Sputum specimens for mycobacterial culture were indicated for the following criteria: (1) persistent symptoms during the previous 3 weeks, (2) current or past tuberculosis history, (3) positive tuberculin skin tests (defined as  $\geq 5$  mm induration at 48 to 72 hours<sup>10</sup>), (4) nonreactive tuberculin test and anergy panel (defined as  $< 2$  mm induration to all three antigens at 48 to 72 hours), and (5) abnormal radiographic findings suggestive of tuberculosis. A lower limit of 5 mm was used for defining a positive tuberculin test, since all residents were potential contacts of case patients known to reside at the hotel and most were infected with the human immunodeficiency virus (HIV).<sup>10</sup> A package of 10 subway tokens worth \$12.50 was provided to all residents who

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completed the interview, radiographic screening, and skin test reading.

## Results

Among the 116 hotel residents, 106 (91%) agreed to participate. Completion rates were as follows: interview, 100% (n = 106); chest radiographs, 94% (n = 100); and skin testing, 91% (n = 96). Ninety-three (88%) residents completed all three screening modalities. The median age of residents was 41 years (range = 27 to 81 years), and 77% (n = 82) were male. Seventy-nine residents (75%) were Division of AIDS Services clients; the remainder were either private tenants (n = 18; 17%) or full-time roommates (n = 9; 8%).

Sixteen cases of tuberculosis were identified among the study participants (a prevalence of 15%); all occurred among persons with AIDS ( $P < .01$ ). All tuberculosis cases had been diagnosed previously. Eight of the participants with tuberculosis (50%) had been compliant with antituberculosis therapy, and the remaining eight had been lost to medical follow-up. The median duration of therapy completed among case patients who were compliant was 3 months (range = 1 to 4 months); the median duration of therapy completed among case patients lost to follow-up was 2 months (range = 1 to 7 months). Among case patients who were noncompliant, a median of 2.5 months (range = 1 to 12 months) had elapsed since they were lost from treatment.

Eleven (69%) cases were identified by cross matching with the tuberculosis registry; five additional cases were identified by surveying for tuberculosis history during the interview. Thirteen (81%) case patients reported symptoms consistent with active disease. Seven (58%) of 12 case patients who completed tuberculin skin testing had positive results. Four case patients reported prior positive tuberculin tests. Only 5 (31%) case patients had abnormal radiographic findings; all had infiltrates suggestive of tuberculosis, including one cavitary lesion. Four case patients with abnormal radiographic findings had been noncompliant with medical therapy (Table 1).

We verified the diagnoses of the five (31%) cases not listed on the tuberculosis registry by reviewing medical records. Four case patients had not been reported to the health department by either their physician or the laboratory. One case was culture positive; three were culture negative, with diagnoses based on clinical

**TABLE 1—Evaluation of Methods for Detecting Tuberculosis among Participants at Hotel A**

Screening Modality	Sensitivity, %	Specificity, %	Predictive Value Positive, %	Predictive Value Negative, %
Questionnaire survey for tuberculosis history	100	100	100	100
Registry cross match	69	100	100	95
Symptom history (fever, cough, night sweats, or weight loss persisting for 3 wks)	81	51	23	94
Tuberculin testing	69	83	42	94
Chest radiograph	31	94	50	88

criteria. The fifth case was diagnosed in prison and was reported to the health department under an alias.

Sputum samples were obtained from 14 case patients; 2 had positive smears and 3, including both of those with smear-positive specimens, were culture positive for tuberculosis. All 3 culture-positive patients had been noncompliant with treatment. Two patients had isolates that were multidrug resistant, one to both isoniazid and rifampin and the other to isoniazid, rifampin, ethambutol, streptomycin, pyrazinamide, and kanamycin. An additional 2 case patients, both culture negative at the time of our investigation, had diagnoses of resistant tuberculosis, one to isoniazid alone and the other to isoniazid and rifampin.

The health department's costs for detecting these 16 tuberculosis cases were compared by screening strategy: registry match, questionnaire interviews, radiographs alone, or skin testing with radiographic follow-up (Table 2). The last strategy limited the use of radiographic follow-up to those residents with either positive tuberculin tests or anergy.

None of the 11 employees at hotel A were found to have active tuberculosis or evidence of recent tuberculosis infection.

## Discussion

The high prevalence of tuberculosis in congregate facilities<sup>3,12-15</sup> dictates the need for practical, economical, and effective methods for screening residents for active disease. Screening at hotel A, a single-room-occupancy hotel for homeless persons with AIDS, identified only residents whose tuberculosis had been diagnosed before the on-site survey. However, 50% of case patients had been lost to follow-up and were no longer compliant with therapy. Patients with inadequately

treated tuberculosis residing in congregate settings for persons with AIDS are potential sources of transmission to other residents. Although the remaining case patients were compliant at the time of our investigation, the risk of future noncompliance in this population makes it essential to identify all patients residing at congregate facilities to ensure completion of therapy.

Although the questionnaire survey seemed the most useful screening method at hotel A, the interviewers were aware of the registry cross-match results before the interview. The five cases not found on the registry reflect both the failure of health care providers to notify health departments of culture-negative cases and the diagnosis of tuberculosis in patients using aliases.

Previous recommendations for tuberculosis screening in congregate settings have limited the use of chest radiographs to patients with either positive skin tests or compatible symptoms.<sup>16</sup> In our investigation, only five (31%) cases would have been identified by these criteria in the absence of information about tuberculosis history. Our results reflect the low sensitivity of chest radiographs in populations consisting predominantly of persons with AIDS, who are more likely to have atypical radiographic findings.<sup>17</sup> Although this protocol would have identified both case patients with positive smears, only two (25%) of eight case patients lost to follow-up would have been detected.

Although the questionnaire interview and the registry cross match were useful in locating noncompliant tuberculosis patients, no previously undetected cases were identified. Unlike residents in other congregate settings, the clients at Division of AIDS Services hotels are usually referred on hospital discharge;

**TABLE 2—Costs of Tuberculosis Screening Strategies at Hotel A, Including Cost per Case Detected**

Screening Strategy	(A) Cost per Test, \$	(B) No. Tests Performed On-Site at Hotel A	(C) Total No. Persons with Positive Tests	(D) No. Tuberculosis Patients with Positive Test	(E) Total Cost of Screening at Hotel A, <sup>a</sup> \$	(F) Cost per Case Detected, <sup>a</sup> \$
Registry cross match	0.33	116	11	11	621	56
Questionnaire survey for tuberculosis history and symptoms	3.30	106	16	16	1198	75
Chest radiograph	42.50	100	10	5	4780	956
Tuberculin skin tests followed by radiographs for all persons with abnormal skin test results <sup>b</sup>	13.30 (skin testing); 42.50 (radiograph)	89 skin tests; 77 radiographs	6	5	4774	955

Note. The cost per test was calculated based on the following: staff salary (including benefits) (\$17.50 per hour); tuberculin and anergy testing (\$3.80 per test); portable chest radiographs (\$37.50); and mycobacterial smear and culture (\$50). Staff salary was factored into the costs of the registry match, questionnaire survey, and skin testing. Patients' transportation expenses were added to the mycobacteriology costs. Incentives (subway tokens and lunch) were included in the costs of the interview, skin testing, and chest radiography.

<sup>a</sup>Based on the following formulas: E = (A × B) + (C × \$53 per sputum smear and culture) and F = (E/D).

<sup>b</sup>Radiographs obtained for residents with either positive tuberculin tests or anergy.

therefore, most hotel A residents had been under medical care within the previous year.

Cost issues are important considerations to health departments attempting to control tuberculosis. The registry match was the most inexpensive method; however, the on-site interviews cost only \$115 per additional case detected. Screening by a combination of interviews and registry match was both effective and economical. Skin testing and radiographic screening added substantial costs to the investigation without identifying additional cases, although tuberculin testing did identify candidates for preventive therapy.

An integral component of our investigation was the use of incentives to improve participation rates. Previous reports have documented the usefulness of inducements in increasing compliance with medical treatment.<sup>18-21</sup> Screening programs without incentives, in settings similar to single-room-occupancy hotels, have shown lower participation and skin test follow-up rates.<sup>12-15</sup>

A substantial number of case patients at hotel A had been lost to follow-up. Because of the challenges in ensuring compliance, directly observed therapy has become the recommended standard for tuberculosis care.<sup>22-24</sup> Directly observed therapy has been successful in ensuring completion of therapy for residents of homeless shelters.<sup>25</sup> The 16 residents with tuberculosis identified during our investigation were enrolled in an on-site directly observed therapy program.

After this study, the Bureau of Tuberculosis Control and the Division of AIDS Services expanded tuberculosis screening and directly observed therapy programs to other single-room-occupancy hotels in New York City. A Bureau of Tuberculosis Control staffperson is now stationed at the Division of AIDS Services intake site and surveys all new admissions for tuberculosis history by matching with the registry and a brief questionnaire. In this way, persons with tuberculosis are identified early, referred for medical evaluation, and assigned to one of five hotels that now offer directly observed therapy on-site. Our collaborative program between local health and housing authorities can serve as a model for other urban settings with large homeless populations at risk for tuberculosis and HIV infection. □

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## ABSTRACT

Interviews were conducted among 408 adults with acquired immunodeficiency syndrome at three local health departments to determine the proportion who owned pets, their perceived attachment to their pets, and the proportion who were informed about zoonoses. Nearly half (187, or 46%) were living with pets, most commonly dogs (64%), followed by cats (38%), fish (15%), birds (8%), reptiles (3%), and rodents (2%). Most pet owners (81%) reported an attachment to their pet. Only 10% were informed of zoonoses, albeit some incorrectly. Health care providers should recognize the high pet ownership rate among persons infected with human immunodeficiency virus and correctly inform their patients of strategies to sustain a low zoonotic disease incidence. (*Am J Public Health.* (1995; 85:1559-1561)

## Pet Ownership among Persons with AIDS in Three Florida Counties

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### Introduction

Nearly half of American households include pets.<sup>1</sup> Compelling evidence supports the value of companion animals, particularly for the elderly or infirm.<sup>2,3</sup> Notably, in many of the panels of the acquired immunodeficiency syndrome (AIDS) Quilt, animals are recognized. But because animals can also transmit infections, issues regarding hygiene and animal health must be addressed. Through interview and AIDS registry review, we examined the association of pet ownership with reported opportunistic infection(s), self-reported attachment to pets, and health care information about pet ownership among persons with AIDS residing in Florida.

### Methods

In collaboration with the Centers for Disease Control and Prevention, Florida conducts the Supplement to HIV/AIDS Surveillance (SHAS) project in Dade (Miami area), Broward (Ft Lauderdale area), and Duval (Jacksonville area) coun-

ties. Adults (aged 18 and older) reported with AIDS who are patients of selected facilities are eligible for interview after informed consent is gained. Methods used by the Florida project have been described in detail elsewhere.<sup>4</sup>

From September 1993 through December 1993, surveillance project participants were asked the following questions to supplement the standardized questionnaire: (1) In the past 5 years, has there been a pet in your household? (2) What type of pet(s)? (3) How attached would

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